UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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IN RE METHYL TERTIARY BUTYL ETHER PRODUCTS LIABILITY LITIGATION

Master File No. 1:00-1898
MDL 1358 (SAS), M21-88

This document pertains to:

City of New York v. Amerada Hess Corp., et al., Case No. 04-CIV-3417.

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DECLARATION OF ANDREW E. SCHULMAN, PH.D., IN OPPOSITION TO DEFENDANTS' JOINT MOTION IN LIMINE TO EXCLUDE THE OPINION OF PLAINTIFF'S EXPERT HARRY T. LAWLESS, WITH EXHIBITS

I, ANDREW E. SCHULMAN, PH.D., declare:

1. I am currently employed as a Statistician in the Office of Enforcement and Compliance Assurance of the United Sates Environmental Protection Agency ("EPA") in Washington, D.C. I make this declaration in my capacity as an employee of EPA and from personal knowledge and, if called to do so, could and would testify competently to the matters set forth below.

2. I earned a Bachelor of Arts degree in Mathematics from Austin College in Sherman, Texas in 1987, a Masters of Arts degree in Mathematics from the University of Texas in Austin, Texas in 1993 and a Ph.D. in Statistics with Environmental Science from Cornell University in Ithaca, New York in 1997. I have worked professionally as a Statistician continuously since 1997. A true and correct copy of my Curriculum Vitae is attached as Exhibit 1.

3. Starting in 2000, I began work in my capacity as a Statistician for EPA on a review of existing studies on odor detection thresholds for methyl tertiary butyl ether (MTBE) in

drinking water. At the time, EPA was considering establishing a Secondary Maximum Contaminant Level (SMCL) for MTBE. The objective of my work was to develop a statistically and scientifically sound approach for estimating what fraction of people can detect MTBE in drinking water, and how reliably, at a given concentration based on data generated in prior studies. This work culminated in a final EPA report, authored by me, entitled *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water*, EPA Report No. 815-R-01-024, which was published in August 2001. A true and correct copy of *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water*, EPA Report No. 815-R-01-024, as it is maintained in the agency's files, is attached as Exhibit 2.

4. The primary focus of the *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water* report was a reexamination of the data presented in a MTBE odor study entitled "Implications of a MTBE Consumer Threshold Odor Study for Drinking Water Standard Setting," by Andrew J. Stocking, Irwin H. Suffet, Michael J. McGuire and Michael C. Kavanaugh, dated June 12, 2000, which I referred to in my report, and will refer to here, as "Stocking et al. (2000)." It is my understanding that, at the time I reviewed the Stocking et al. (2000) study in the second half of 2000, it was as-yet unpublished and that EPA personnel involved in the MTBE SMCL process had received a copy of the manuscript in the normal course. During, and in connection with, my work on the *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water* report, I communicated with Andrew Stocking regarding the Stocking et al. (2000) study and the statistical analysis presented in that study. A true and correct copy of the Stocking et al. (2000) manuscript that I reviewed for purposes of the *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water* report, as it is maintained in the agency's files, is attached as Exhibit 3.

5. Prior to final publication of the *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water* report, EPA submitted a draft of the report to four experts for peer review: a sensory methods expert, a water industry expert, and two statisticians.

6. I have been provided by counsel for the City of New York in the lawsuit listed in the caption above with a document entitled Defendants' Joint Motion and Motion in Limine To Exclude the Opinions of Plaintiff's Expert Harry T. Lawless, dated April 23, 2009. I have also been provided by counsel for the City of New York with a document entitled Expert Report of Harry T. Lawless, Ph.D., dated February 5, 2009, and a document entitled Expert Rebuttal Report of Harry T. Lawless, Ph.D., dated March 20, 2009. I have reviewed these documents.

7. The Defendants' assertion in their Joint Motion that Dr. Lawless' analysis "suffers fatally from a methodology problem" is, in my opinion, unjustified and incorrect. Statistical methods other than those prescribed by ASTM method E-679 may legitimately be used to analyze the data from the Stocking study, and the particular methods employed by Dr. Lawless in the Expert Report are appropriate and scientifically valid.

8. In support of their assertion, the Defendants argue that one may not legitimately answer questions or use analytical methods that weren't foreseen or intended in the design of the experiment. Basic statistical theory contradicts this argument. Statistical analysis is built on probability models, which depend on assumptions about the way in which the data are collected, but have nothing at all to say about the experimenter's intent or state of mind. Therefore, the validity of a statistical analysis does not depend on whether the experimenter foresaw it at the time of the experiment. Rather, it depends on whether the data satisfy the assumptions of the analysis. In short, we are not forever doomed to use only the ASTM E-679 analysis, just because the Stocking study was designed with that analysis in mind.

9. The Defendants further argue that only the ASTM E-679 method is valid because it is "the industry standard" used to set treatment levels, while other methods are invalid because they are "novel," "non-prescribed," and "not sanctioned by or specified in the ASTM standard." This argument fails for three reasons. First, ASTM E-679 defines only one possible odor detection threshold (the level at which half of consumers can detect a contaminant half of the time), not the only one for all purposes. There is an infinite number of such possible thresholds, and no one of them can be expected to be right for all purposes. Different thresholds can, for example, be used to initiate regulatory action than are used to set treatment levels. The text of ASTM E-679 never says otherwise, and in fact it never states any purpose for which it must or must not be used. Second, once a different threshold definition is selected, the estimator specified in ASTM E-679 will in general no longer be the right one, since it estimates a different threshold. Third, no published standard or method can substitute for the best professional judgment of a qualified analyst. It is emphatically the statistician's job to assess the available data and analytical methods, use his or her professional judgment to choose the best method for the problem at hand, and even develop new methods of analysis if the existing methods are inadequate.

10. The particular methods used by Dr. Lawless in his Expert Report are scientifically valid. The techniques of linear and logistic regression analysis employed there are basic statistical workhorses, widely used and well understood, and applicable to the Stocking data. Estimation of the levels at which 10% or 25% of subjects can detect the contaminant is also valid and more or less routine from the Stocking data, since with 57 subjects, the 10th and 25th response percentiles are well within the range of the study observations.

11. The linear regression analysis used by Dr. Lawless should be viewed as a simplified approximation to the more accurate logistic regression. The logistic regression is to be preferred in this case because its assumptions are more appropriate over the full range of the Stocking data. The difference between the two sets of results is small however, well within the range of the other sources of error identified by Dr. Lawless. In addition, the logistic regression presented by Dr. Lawless does not account for the correlation of the percent correct values across concentrations. This correlation exists because each percent correct value is computed from observations on the same pool of 57 subjects. Again this amounts to a simplifying approximation that introduces a modest additional error.

12. For comparison, the *Statistical Analysis of MTBE Detection Odor Thresholds in Drinking Water* report also used the Stocking data to estimate odor detection thresholds. Using a different method of estimation that does not rely on Dr. Lawless' approximations, it found that 10% of subjects can detect MTBE in drinking water half of the time at between 1.4 and 3.7 ppb, and 25% can detect it half of the time at between 3.7 and 8.5 ppb, with 95% confidence. These estimates are close to Dr. Lawless' estimates of 1-2 ppb and 3 ppb, respectively. They therefore tend to support his analysis generally, and suggest that the approximations he used are small.

I hereby declare under penalty of perjury under the laws of the United States that the foregoing statements are true and correct.

Executed on this 14th day of May, 2009, in Washington, D.C.

ANDREW E. SCHULMAN, PH.D.